A CLADDING ELEMENT

Field of the Invention

The present invention relates to cladding elements, more particularly to cladding elements adapted for side by side assembly with a like element.

The invention has been primarily developed in relation to cladding elements which can be connected together along their longitudinal edges to provide roofing/ceiling sheets. However, it will be appreciated by persons skilled in the art that the invention is not limited to this particular use and also finds application in walling, decking and other types of cladding.

Background of the Invention

Australian patent no. 711048 discloses a cladding sheet marketed by BHP Steel Pty Ltd under the Trade Mark FLATDEK. FLATDEK has a substantially flat web with generally triangular male and female formations along opposed longitudinal edges. The primarily usage of FLATDEK is of a roofing sheet with the web fastened to a supporting structure, such as battens or purlins by nails or screws which pierce the sheets and engage the support structure. The sheets are installed by pivoting the female formation of the sheet being installed over, and into engagement with, the male formation of the last installed sheet.

A disadvantage of FLATDEK is the sheets can only be connected by pivoting the female formation over the male formation. This means that, when installing from within a room, FLATDEK can only be installed as ceiling sheets with the male and female formations projecting into the room space, which is visually undesirable. Accordingly, FLATDEK is normally only used a roof sheet.

Another disadvantage of FLATDEK is the fasteners used to attach it to the support structure are visible. This is also visually undesirable.

The disadvantages described above in relation to FLATDEK are shared by the majority of the cladding sheets presently available.

Object of the Invention

It is an object of the present invention to substantially overcome, or at least ameliorate, one or more of the disadvantages.

Summary of the Invention

Accordingly, in a first aspect, the present invention provides a cladding element for use in a cladding element assembly, the cladding element including:

a substantially flat web having a pair of opposed longitudinal edges;

a male rib formation extending at least partially along one longitudinal edge and having a pair of spaced apart inner and outer upstanding ribs and an engaging formation; and

a female rib formation extending at least partially along the other longitudinal edge and having an inner upstanding rib, an outer depending rib and a joining section, between the inner and outer ribs and displaced from the plane of the web, and a corresponding engaging formation, at least one of the male or female rib formations being at least partially resiliently flexible,

wherein the element is adapted for assembly with a like element by positioning of the male formation substantially within the female formation with their respective engaging formations in engagement, whereby the assembled male and female formations together form a substantially rectangular closed channel adapted for concealment of fixing means used to fix the cladding elements to a supporting structure.

When the major visible surface of the web is the side remote from the male and female formations, the fixing means are positioned between the inner and outer ribs of the male formation. When the major visible surface of the web is the side adjacent to the male and female formations, the fixing means are positioned in the joining section (ie. between the inner and outer ribs of the female formation).

In one form, the engaging formation of the male rib formation is a flange angled inwardly and towards the web on the distal end of the inner male rib formation and the corresponding engaging formation of the female rib formation is a flange angled inwardly and away from the web on the distal end of the outer female rib formation. At least one of the inner male rib or the outer female rib are preferably flexible to allow resilient flexing displacement as the angled flanges ride over one another during engagement.

The male and female rib formations are preferably both resiliently flexible.

In another form, the engaging formation of the male rib formation is an outwardly directed flange on the distal end of the outer male rib formation and the corresponding engaging formation of the female rib formation is an outwardly directed recess on the distal end of the inner female rib formation.

The cladding element preferably include both forms of the engaging formations defined above.

Preferably, the proximal end of the outer male rib formation includes an outwardly convex formation adapted to engage with an inwardly concave formation on the proximal end of the outer male rib formation.

The cladding element is preferably formed from a single piece of roll formed steel.

The male rib formation is preferably formed by folding some of the web back on itself. A layer of adhesive is preferably included between at least some of the web that is folded back on itself.

In one embodiment, the layer of adhesive is an adhesive strip, most preferably VHB (Trade Mark) tape marketed by the 3M company. In another embodiment, the layer of adhesive is a glue, most preferably Jetweld TS230 (Trade Mark).

The web preferably includes a plurality, most preferably two, longitudinal stiffening channels. The channels are preferably convex towards the rib formations.

In a second aspect, the present invention provides a cladding element for use in a cladding element assembly, the cladding element including:

a substantially flat web;

a longitudinal interlocking formation formed by folding at least some of the web back onto itself; and

a layer of adhesive between at least some of the adjacent web folded back on itself.

In one embodiment, the layer of adhesive is an adhesive strip, most preferably VHB (Trade Mark) tape marketed by the 3M company. In another embodiment, the layer of adhesive is a glue, most preferably Jetweld TS230 (Trade Mark).

Brief Description of the Drawings

Preferred embodiments of the present invention will now be described, by way of examples only, with reference to the accompanying drawings in which:

Fig. 1 is a perspective view of the cladding element according to a first embodiment of the invention;

Fig. 2 is a front view of the element shown in Fig. 1 during installation as a roofing sheet;

Fig. 3 is a front view after completion of the installation shown in Fig. 2;

Fig. 4 is a front view of the element sheet shown in Fig. 1 during installation as ceiling sheet;

Fig. 5 is a front view of the element shown in Fig. 4 after installation;

Fig. 6 is a roll forming flower diagram of the sheet shown in Fig. 1; and

Fig. 7 is a partial front view of the cladding element according to a second embodiment of the invention.

Detailed Description of the Preferred Embodiments

Referring firstly to Fig. 1, there is shown a first embodiment of a cladding element 10 according to the invention. The element 10 is formed from a strip of 0.42mm base metal thickness (BMT) sheet steel. The element 10 is preferably produced by role forming, as will be described in more detail with reference to Fig. 6.

The element 10 has a substantially flat central web 12 with a male rib formation 14 extending along one longitudinal edge and a female rib formation 16 extending along the other longitudinal edge. When the element 10 is used as a roofing or ceiling sheet, the web side 12' is the lower most part (ie. the underside). When the element 10 is used as a wall cladding sheet, the web side 12' is that which is visible from within the clad room.

The web 12 also has a pair of longitudinally extending, substantially parallel, spaced apart minor stiffening ribs 18, which are convex in the same direction as the male and female rib formations 14,16.

The web is approximately 260mm wide with the stiffening ribs 18 being approximately 12mm wide and extending away from the plane of the rib by about 5mm. The male rib formation 14 is approximately 26mm wide and extends away from plane of the web 12 by about 44mm. The female rib formation is approximately 37mm wide and extends away from plane of the web 12 by about 45mm. The elements 10 are generally produced in lengths of about 6 meters, with lengths of up to about 9.6 meters possible (generally subject to transporting limitations).

The male rib formation 14 comprises an inner upstanding rib 20 having an angled flange 22 on its distal end. The flange 22 is angled inwardly and towards the web 12. The male rib formation 14 also includes an outer upstanding rib 24 that has an outwardly directed flange 26 at its distal end and an outwardly convex channel 28 at its proximal end. The male formation 14, with the exception of the inner rib 20, is of double thickness to that of the web 12 and is formed by folding the web over and back on to

itself, as will become more evident from Fig. 6. This folding advantageously allows the element 10 to be formed from a single piece of steel.

The female rib formation 16 has an inner upstanding rib 30 with an outwardly concave recess 32 at its distal end and an outwardly concave channel 34 at its proximal end. A joining section 36 extends outwardly from the distal end of the inner rib 30 and is substantially parallel to and displaced from the web 12. An outer rib 38 depends from the joining section 36 and has an angled flanged 40 at its distal end. The flange 40 is angled inwardly and away from the web 12.

In the preferred embodiment shown, the thin sheet metal construction of the element 10 results in various components of the male and female rib formations 14, 16 being resiliently flexible under load and able to be displaced from the positions and orientations shown in Fig. 1 and resiliently returned to those orientations when no longer subject to load.

Fig. 2 shows the cladding element 10, and a like cladding element 10', during installation as a roofing sheet and being fastened to a supporting batten 42. The installation process begins with the cladding element 10 being fastened adjacent the male rib formation 14 by a fastener, such as a self tapping/drilling screw 44. The screw 44 is driven threw the element 10 between the inner and outer ribs 20 and 24 of the male rib formation 14. The female rib portion 16 of the cladding element 10' is pressed over the male rib formation 14 of the cladding element 10 and into locking engagement with same. During this engaging process, the rib 38 flexes outwardly as indicated by arrow 46 and the rib 20 flexes inwardly as indicated generally by the arrow 48 until the angled flange 22 is received into engagement with the angled flange 40 as shown in Fig. 3. When this occurs the flange 26 is also located within the recess 32 and the channel 28 located within the channel 34. There may also be some flexing of the rib formation 24 and 30 during the engaging process, as indicating generally by arrows 50 and 52. The engaging process can also be assisted by initially tilting the element 10' away from the element 10 to initially position the flange 22 in engagement with the flange 40 and then pivoting the remainder of the male and female rib formations 14 and 16 into engagement with one another, as indicated generally by the arrow 54.

Successive elements can thus be sequentially attached to another by following a similar method. The right hand end of the element 10 is preferably fixed to the batten 42 by initially fastening a section of cladding element 10 that comprises only the male rib

formation 14 (not shown) and engaging the cladding element 10 with that formation 14 in the manner previously described.

With reference to Fig. 3, it can be seen that the male and female rib formations 14, 16 form, after assembly, a substantially rectangular closed channel 56 which advantageously conceals the screw 44. This advantageously obviates the need for any additional concealed fixing devices or clips, as are required for known cladding sheets. Further, the sheet material adjacent the recesses 28,32 forms a downwardly concave recess 58 in the bottom left hand corner of the channel 56, which substantially replicates the stiffening channels 18 and thus provides a uniform surface appearance to the cladding elements 10, 10' etc when viewed in the direction of arrow 60.

The installation of the cladding element 10 as a ceiling sheet will now be described with references to Figs. 4 and 5 with like reference numerals used to indicate like features in Figs. 1 to 3.

Turning firstly to Fig. 4, the element 10 is initially fastened to the batten 42 by passing the screw 44 through the connecting section 36 of the female rib formation 16. The cladding element 10' is then introduced into the position generally shown in Fig. 4 and manoeuvred, in the direction of arrow 62, into engagement with the female rib formation 16 of the element 10 as indicated in Fig. 5. During the engaging process the ribs 20 and 40 flex, as generally indicated by arrows 46 and 48. There may also be some slight flexing of the rib 24 as generally indicated by arrow 50. The rib 30 will generally not flex due to it being constrained by the attachment of the element 10 of the batten 42.

As with the roofing sheet installation, the male and female rib formations 14, 16 form, after assembly, the substantially rectangular closed channel 56 which conceals the screw 44. Further, and again similar to the roofing sheet installation, the male and female rib formations 14, 16 also form a downwardly convex channel 58 which replicates those provided by the ribs 18 to provide a uniform and attractive ceiling appearance when viewed in the direction of arrow 60. The left hand end of the cladding element 10 is initially fastened to the batten 42 by engagement with a female rib formation 16 (not shown) previously fastened to the batten 42.

Figs. 4 and 5 also represent the top view of an installation of the element 10 as a wall cladding with the surface 12' of the web 12 presenting a uniform, visually appearing, surface to the interior of the clad room.

The forming of the closed channels 50 described above also provides improved resistance to leaking compared to known cladding sheets, which rely on the rubber washers between the exposed fastener heads and the cladding sheets. Further, when a roofing installer is notching a tile flushing for a flush fit with the roofing cladding, the substantially rectangular channel 56 is a much easier shape for the notched flushing to conform to. This results in reduced installation times and less chance of gaps and associated leaks.

As mentioned above, the element 10 is preferably formed form a single piece of metal by roll forming in accordance with the process shown in the roll forming flower diagram of Fig. 6.

Referring now to Fig. 7, there is shown a second embodiment of a cladding element 70 according to the invention. Like reference numerals to those used in describing the first embodiment have been used to indicate like features in the second embodiment.

The element 70 is also formed from a strip of 0.42mm base metal thickness (BMT) sheet steel and produced by the role forming process described with reference to Fig. 6. The roll forming process includes folding the web 12 back onto itself to form the male rib formation 14. This also results in there being two adjacent web layers 72 and 74, between the inner and outer upstanding ribs 20 and 24.

In the element 70, a 6mm wide strip of adhesive 76 (darkened region) is inserted between the layers 72 and 74 to prevent them from separating. The adhesive strip is preferably VHB (Trade Mark) tape marketed by the 3M company. The tape is fed into the roll former during the roll forming process. Jetweld TS230 glue could also be used but the tape is easier to incorporate into the roll forming process.

As stated above, the adhesive strip 76 prevents the two web layers 72 and 74 from separating. This advantageously allows longer spans of the element 70 to be installed between fixings when compared to the element 10. Alternatively, the element 70 can withstand higher wind loads than the element 10, when installed with similar fixing spacing.

Although the invention has been described with reference to a preferred embodiment, it would be appreciated by those skilled in the art that the invention may be embodied in many other forms. For example, although it is preferred, it is not necessary for the male and female rib formation to extend over the entire length of the cladding

elements. An alternative is a series of discrete spaced apart lengths of male and female rib formations. Further, the element can alternatively be formed from sheets of plastics or other materials.